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ABSTRACT

This study investigated the effects of (1) verbal instruction alone vs. verbal instruction complemented by simple line drawings; (2) visual testing vs. nonvisual testing; (3) verbal cueing vs. free recall on achievement; and (4) order of testing on subsequent achievement. Interactions among type of instruction, type of testing, and order of testing were also examined. The 151 undergraduate subjects were instructed with varied combinations of visual and nonvisual versions of the Dwyer instructional materials. Visuals did improve identification and comprehension achievement, with effects retained after 2 weeks. Achievement was higher on the immediate but not the delayed nonvisual test for terminology, comprehension, and composite scores than on the nonvisual version. The order of the drawing test administration had no effect. However, drawing test performance was significantly better for students who had previously taken the visual achievement test. An interaction among visual instruction, the nonvisual test, and the administration of the drawing test before the achievement test was revealed for the immediate identification test. Interactions among visual instruction, the visual test, and the drawing test after achievement test were found for both the delayed total criterion test and the immediate drawing test. (LMM)

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A MULTIFACTOR ANALYSIS OF THE INSTRUCTIONAL
EFFECT OF TYPE OF INSTRUCTION, TESTING, RECALL
AND ORDER OF TESTING

by

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A Multifactor Analysis of the Instructional Effect
of Type of Instruction, Testing, Recall and
Order of Testing

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Background

A considerable amount of research has been conducted in an attempt to determine whether there is a difference in achievement among students who receive visualized instruction and are evaluated verbally and those who receive visualized instruction and are evaluated visually (Torrence, 1976; Dwyer, 1978; Szabo, Dwyer & DeMelo, 1981). In this respect a number of different types of strategies have been utilized to investigate the parameters of visual testing, e.g., film (Carpenter, 1954), slides (Stallings, 1972; Dwyer & Tanner, 1978), etc. However, a more comprehensive understanding of the visual testing phenomenon might well be achieved with a more systematic examination of the relationship among (a) different types of visual-testing formats, (b) the level of student achievement of different types of educational objectives, and (c) their effects (visual) on short-term (STM) and long-term memory (LTM).

Problem

The purpose of this study was to empirically investigate (a) the effect of verbal instruction alone vs. verbal instruction complemented by simple line drawings, (b) the effect of visual testing vs. nonvisual testing, (c) the effect of verbal cued vs. free recall on students' achievement, (d) the effect of order of testing on subsequent achievement, and (e) the interactions among type of instruction, type of testing and order of testing.

Procedure & Experimental Design

One hundred fifty-one undergraduate students enrolled at The Pennsylvania State University volunteered to participate in this study. The design of the experiment was a posttest only, 2x2x2x2 factorial design (Figure 1). Students were randomly assigned to one of the sixteen treatment cells. The four independent variables were (1) type of instruction: visual and nonvisual, (2) types of achievement test: visual and nonvisual, (3) types of drawing test: free recall and verbal cued recall, (4) order of drawing test: before and after completion of the three criterion measures. The dependent variables

		Types of Achievement Test					
		VISUAL		NONVISUAL			
TYPES OF INSTRUCTION	VISUAL	N=10	N=9	N=10	N=9	TYPES OF DRAWING TEST	FREE RECALL VERBAL CUED RECALL
	NONVISUAL	N=10	N=9	N=9	N=9		
	VISUAL	N=10	N=10	N=10	N=10		
	NONVISUAL	N=8	N=10	N=9	N=9		
		BEFORE	AFTER	BEFORE	AFTER		
ORDER OF DRAWING TEST							

Figure 1. Experimental design with distribution of subjects by cell.

were (a) performance on the total criterion test (60 multiple choice items), (b) performance on the individual criterion tests-identification, terminology and comprehension, and (c) performance on the drawing test (18 items).

Types of Instruction

Instructional booklets employed in this experiment consisted of 37 pages which had previously been designed by Dwyer (1972,1978). The booklet employed in Treatment 1 consisted only of printed words. Treatment 2 contained the same printed words as did Treatment 1; however, each printed page contained a simple line drawing of the human heart designed to complement the printed instruction.

Modes of Achievement Test

The achievement tests used in this study were the original version of Dwyer's achievement test on The Human Heart (Dwyer, 1972, 1978) and the visual version of the same tests developed by DeMelo (1980).

Identification Test. This test consisted of 20 multiple-choice items with five alternatives which required the subject to identify the numbered parts on a detailed drawing of a heart. Each part of the heart presented on the instructional units received a number which was associated to the multiple-choice segment of the test; KR-20=.86 on the immediate test, and KR-20=.83 on the two weeks delayed retest.

Terminology Test. This test consisted of 20 multiple-choice items with five alternatives each, designed to measure the subjects' knowledge of specific facts, terms and definitions related to the human heart; KR-20=.82 on the immediate test, and KR-20=.81 on the two weeks delayed retest.

Comprehension Test. The comprehension test consisted of 20 multiple-choice items with four alternatives each. Given the location of certain parts of the heart at a particular moment of its functioning, the subjects were asked to locate the position of other specified parts of the heart at the same point in time. This test was designed to measure a type of understanding that occurs when an individual fully grasps what is being communicated and can use the information being received to explain some other phenomenon occurring simultaneously; KR-20=.72 on the immediate test, and KR-20=.74 on the two weeks delayed retest.

The reliabilities of the total criterion test score of the paper-pencil version of the achievement test were KR-20=.92 on the immediate test and KR-20=.91 on the two weeks delayed retest.

The Visual Version of the Achievement Test

The visual version of the achievement test developed by DeMelo (1980) was an attempt of having a literal version of a test from a verbal language, into a visual language. Its main characteristic was the use of visual items and the reduction of printed words to a minimum in such a way that printed words were used only for stem of the question. The response options of each visual item were fully visual, and the illustrations were identical to those used in the visualized instructional unit. The obtained KR-20 for the immediate and delayed retention on each of the visualized versions of the criterion measures follow: identification (.82, .82), terminology (.74, .74), comprehension (.76, .60), total criterion test (.91, .90).

The Drawing Test: Cued Recall-Free Recall

The drawing test in this experiment was also composed in two versions; Dwyer's original version (1972, 1978) herein named Verbal Cued Version of the Drawing Test, and the Free Recall Version of the Drawing Test first used in this study.

The Verbal Cued Version of the Drawing Test had as its objective the evaluation of the subjects ability to construct and/or reproduce items in their appropriate context. For example, the test (N=18) items provided the students with a numbered list of terms, e.g., (1) superior vena cava; (2) aorta; (3) tricuspid valve; (4) pulmonary vein; etc. corresponding to the parts of the heart presented in the instructional unit. The subjects were required to draw a representative diagram of the heart (a symbol like a valentine sufficed; the quality of the drawing did not enter into the scoring) and place the numbers of the listed parts in their respective positions. In this test, the emphasis was

the correct positioning of the verbal symbols with respect to one another and to their concrete references. The Free Recall Version of the Drawing Test had the same characteristics of its verbal cued version except for the absence of the verbal cues.

Results

A 2x2x2x2 analysis of variance was conducted on the dependent variables for both immediate and delayed retention testing. Reported findings were significant at the .05 level. The results of this study suggest that:

1. The use of visuals (simple line drawings) as mediation of written instruction improve students' achievement at different cognitive levels (identification and comprehension) and its effects were retained two weeks later.
2. Students participating in this study performed better on the immediate nonvisual test on subscales terminology, comprehension, and composite scores than did equivalent subjects on the visual version of the same test; this effect, however, disappeared two weeks later.
3. The order of drawing test (before or after the achievement test) had no significant effect on subjects' performance on the achievement test; the performance on the drawing test, however, was significantly better for the students who received the visual achievement test before the drawing test.
4. An interaction among visual instruction, nonvisual test, and drawing test before the achievement test was revealed for the identification test on the immediate achievement test.
5. Interactions among visual instruction, visual test and drawing test after achievement test were found to exist for both the 2 weeks delayed total criterion test, and on the drawing test for immediate retention.

References

- Carpenter, C. R. Evaluation of the film: Military police support in emergencies (riot control) TF 19-1701 (Technical Report SDC-269-7-52). Port Washington, New York: Special Devices Center, Office of Naval Research, 1954.
- DeMelo, H. T. Visual self-paced instruction and visual testing in biological science at the secondary level. Unpublished doctoral dissertation, The Pennsylvania State University, 1980.
- Dwyer, F. M. Strategies for improving visual learning. State College, PA: Learning Services, 1978.
- Dwyer, F. M. & Tanner, G. Visual testing: A viable instructional variable. British Journal of Educational Technology, 1978, 1, 34-37.
- Stallings, W. M. A comparison of television and audio presentations of the MLA French listening examination. Journal of Educational Research, 1972, 65, 472-474.
- Torrence, D. R. The television test of science processes. Unpublished doctoral dissertation, The Pennsylvania State University, 1976.